

U. S. GEOLOGICAL SURVEY  
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AND MINERAL INDUSTRIES

**Status of 7.5' Geologic mapping in the Portland, Oregon Metro area and Opportunities  
for Cooperative Agreement to create a seamless Digital Geologic Map Database**

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Administrative Report to  
John Beaulieu, Oregon State Geologist  
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## **Geologic Mapping Needs**

The greater Portland, Oregon area (Figure 1) is home to an important and rapidly growing segment of the US economy. Like Seattle, recent research indicates that the earthquake hazard in this part of the Northwest urban corridor may have been underestimated, and the engineering community is pressing for more precise evaluation of earthquake hazards. Required information includes the locations of crustal faults, the frequency of crustal earthquakes, and the distribution of deposits prone to ground failure and severe shaking. Surface water resources in the northern Willamette Valley are also fully committed, and in some communities further growth is contingent on identification of groundwater resources. Renewed agricultural interest in the uplands bordering the northern Willamette Valley has increased the need for better groundwater and geologic information. Local governments are eager for up-to-date geologic mapping to help deal with these issues.

In the 1990's, the Oregon Department of Geology and Mineral Industries (DOGAMI) and the US Geological Survey (USGS) began modern, 1:24,000-scale digital geologic mapping of the greater Portland metro area to address these issues (Figure 1). At present, state and federal mapping are coordinated through the Oregon State Geologic Map Advisory Committee. The Committee represents a wide variety of issues, many of which lie outside the Portland metro area. There is a need to establish a cooperative agreement with dedicated funding to ensure timely completion of a seamless geologic database for the greater Portland urban area. A strategy for such a cooperative agreement between the USGS National Earthquake Hazards Reduction Program (NEHRP) and Pacific Northwest Urban Corridor Mapping Project (funded by NCGMP) is outlined here.

## **Strategy**

With a five-year agreement, DOGAMI and USGS staff can complete seamless, large-scale, digitally based geologic map coverage of the most critical areas of the Forest Grove-Portland-Gresham urban corridor. The geologic maps would meet the following criteria:

- Nominal scale of 1:24,000;
- Regionally-consistent stratigraphy;
- Analytic studies necessary to develop an adequate stratigraphy and chronology for Columbia River Basalt (CRB, an important aquifer and strain marker), older unconsolidated deposits, and for dating of structural deformation;
- Sufficient detail and quality to support derivative hazard maps;
- Consistent digital databases for use by local government, the private sector, and other earth scientists.

Each 7.5' quadrangle is evaluated with regard to the following objectives, in order of importance (Figure 1):

1. Portland Hills fault zone (Portland Hills, Sylvan, Oatfield, E. Bank, etc)

2. Urban areas/critical lifelines/ground response
3. Other crustal structures/fault zones (Beaverton, Canby, Mt Angel-Gales Cr.)
4. Groundwater study areas
5. Agricultural needs

Quads that meet multiple, high priority objectives will be completed first. The new mapping will build on a core of modern maps completed by DOGAMI (e.g., Portland, Lake Oswego, Damascus 7.5' quadrangles) and in progress by the USGS (e.g., Newberg, Scholls, Canby, Camas, and others). A lead agency will be identified for each quadrangle. Newly applied dating techniques, including thermoluminescence, magnetostratigraphy, paleosecular variation, fission track, tephrochronology, and AMS and conventional radiocarbon dating will provide improved stratigraphic resolution. Ground-based geophysical surveys will compliment high-resolution aeromagnetic surveys to provide additional constraints on the location of faults and important lithologic contacts.

USGS focus is on geologic and geophysical mapping of major structures beneath the urban lowland; including the Portland Hills fault, the Canby fault, and the Gales Creek-Mount Angel fault zone. The USGS is also defining the internal stratigraphy of the CRB aquifer in the Tualatin and Northern Willamette Valley in cooperation with scientists from Portland State University and USGS-WRD. Identification of subsurface units and correlation of well logs and geophysical data will provide controls on basin geometry.

DOGAMI has a long history of geologic and hazard mapping throughout the entire State, including a series of geologic and hazard maps for Oregon's cities. Presently, DOGAMI is working in the Klamath and Umatilla basins. A cooperative agreement will allow DOGAMI to also complete new mapping in the Portland-Gresham area and update Open File geologic mapping in the heavily urbanized Portland-Hillsboro corridor. Collaboration and shared mapping efforts are expected, particularly along the trace of the Portland Hills and Beaverton fault zones west of Portland. Cooperation and collaboration with paleoseismologists, geophysicists, and hydrologists in other projects and agencies is ongoing.

## **Approach**

The USGS will complete the 7.5' quadrangles planned and underway along the Gales Creek-Mt Angel and Frontal-Sandy fault zones bounding the urban corridor. DOGAMI will focus on new mapping in the Portland Hills Fault Zone and Oregon City area. Revised mapping of the Beaverton, Hillsboro, Linnton and Mt Tabor quadrangles is a high priority, and lead agencies for these quadrangles will be identified (Figure 1).

Acquisition of a LIDAR survey to provide high-resolution topography for geologic mapping of critical areas along the Portland Hills fault zone is a high priority. Several surface-rupturing faults have been discovered in Puget Sound with LIDAR, and both the USGS mapping staff and DOGAMI are pursuing funding to initiate a pilot study in Portland.

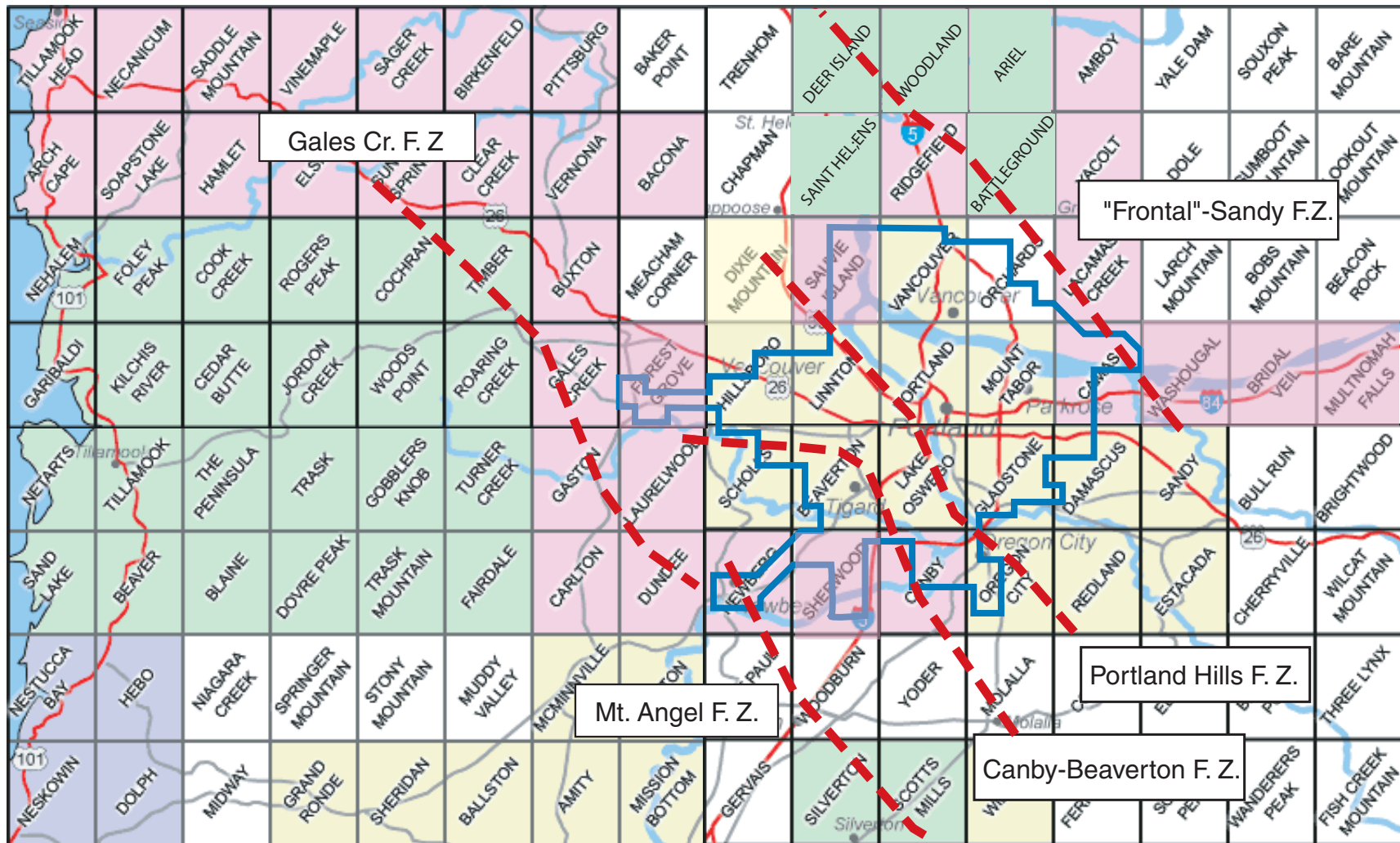
## **Organization**

Project organization reflects three main objectives: interagency cooperation, coordination through the USGS, and partnership with local agencies (Figure 1). The work is a cooperative, collaborative effort of DOGAMI and the USGS. Management of the cooperative agreement will be through the external program of the National Earthquake Hazards Reduction Program. The cities, counties, other agencies, and consultants which use the geologic data are key participants in the geological investigations and potential partners and collaborators.

## **Support**

The USGS mapping team (Pacific Northwest Geologic Mapping and Urban Hazards projects) is supported by the NCGMP, NEHRP, and NASA. As in Puget Sound, the project supports university mappers through contracts and direct analytical and logistic support. DOGAMI is currently funded in part by the state general fund, the STATEMAP component of the NCGMP, and external NEHRP grants. Establishment of a cooperative agreement in FY 2003 will significantly improve opportunities and options for interagency coordination. Additional support from local agencies with a critical interest in mapping progress is anticipated.

7.5 minute Quadrangle mapping, urban boundary, and major fault zones, Portland Metro area



USGS published  
green - online  
purple - paper  
pink - in progress

DOGAMI published  
yellow - paper; digital revision underway in urban growth boundary (blue line); coop w/ USGS

Figure 1